

SURFACE WATER STATION DESCRIPTION

NORTH FORK OF THE BIG HOLE RIVER, NEAR WISDOM, MT – 453800113390001

BIG HOLE NATIONAL BATTLEFIELD

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LOCATION

The National Park Service's Water Resources Division – Water Rights Branch (NPS - WRB) station on the North Fork of the Big Hole River within Big Hole National Battlefield (BIHO) is located at Latitude °45 38'00", Longitude °113 39'00", NE ¼ SW ¼, Sec.24, T. 2 S., R. 17 W., Hydrologic Unit Code 10070001 in Beaverhead County, Montana. Big Hole National Battlefield is located ten miles west of Wisdom, Montana on State Route 43. From Interstate 15 at Dillon, Montana, take Route 278 northwest to Wisdom, then travel ten miles west on State Route 43 to BIHO. From Interstate 15 at Divide, Montana, take State Route 43 west through Wisdom to BIHO. From Missoula, Montana, take U.S. Route 93 south through the Bitterroot Valley to Lost Trail Pass. Turn east on State Route 43 and drive 17 miles to BIHO (Figure 1).

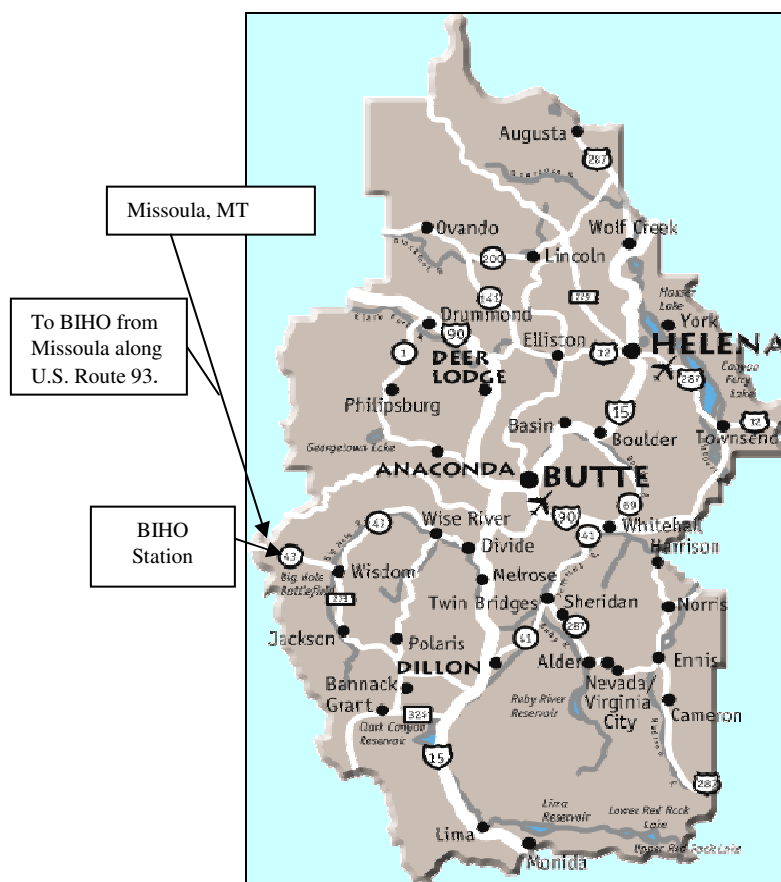


Figure 1. Montana Highway Location Map.

ACCESS:

To get to the station from the Visitor Center, travel south as if you were leaving the park toward State Route 43. After the road that turns east to the residential area turn west onto a dirt road and proceed to a parking lot. No private lands need accessed. Two wheel drive, low clearance vehicles are suitable. There are two trails at the trail head. Take the Nez Perce Camp Trail to the east. Walk approximately 200 yards along the trail to trail marker # 2. The vertical staff is 100 feet north-west of trail marker # 2, along the right bank of the stream (Figure 2).



Figure 2: Station lay-out looking north-west, August 1999. Picture by Henrique Barreto (NPS-WRB).

NOTIFICATION

Prior to visiting the station, always check in at the Visitor Center with either the ranger, or the Superintendent. Refer to the “Local Park Partner” section in the station description for current phone numbers and addresses.

ESTABLISHMENT

The station was established on August 17, 1999 by the NPS – WRB to administer the United States’ Federal reserve water right for instream flows in the North Fork of the Big Hole River. The period of use for the right is November through March for 10 cubic feet per second. (Section 6, BIHO History Folder).

ELEVATION

Elevation of the station is 6,180 feet above sea level as interpreted from the 7.5’ United States Geological Survey (USGS) Big Hole Battlefield topographic map.

DRAINAGE AREA

The drainage area is 130 square miles, (based on Geographic Information System analysis of 1:100,000 USGS DLG data).

HYDROLOGIC CONDITIONS

The North Fork of the Big Hole River is located in the southwest corner of Montana surrounded on three sides by the Continental Divide. The land area consists of deep valleys separated by forested mountain ranges. There are four different mountain ranges; the Beaverhead Mountains of the Bitterroot Range, the Tendoy, the Centennial Range, and the Pioneer Mountains. Land forms range from flat pediments to jagged peaks and broad-river valleys to narrow gorges. Elevations range from 11,154 feet at Tweedy Mountain in the Pioneer range to 4,770 feet on the Big Hole River.¹

Geology consists of granite (quartz monzonite) bedrock, but rocks of the Missoula Group (Precambrian) crop out along the eastern margin toward the Wise River drainage. An aplite and pegmatite facies occurs throughout the quartz monzonite but lamprophyres are unknown. Numerous small and narrow quartz-pyrite veins cut the granite;

¹ Beaverhead Chamber of Commerce, Dillon, MT.

many of them associated with aplite. Gold and silver are found in some of these veins but the values are irregularly distributed and individual ore shoots are small (Geach 1972)².

Beaverhead County area is unique in that it is both cold and dry. Precipitation varies widely. Average annual precipitation ranges from 10 inches in Dillon to over 50 inches in mountains forming the Continental Divide to the west. Two-thirds of the precipitation in the mountains occurs as snow. Average temperatures range from 21 degrees Fahrenheit in January to 66 degrees Fahrenheit in July. Cloudy weather rarely exceeds more than several days.³ Spring runoff occurs in late May or early June.

The North Fork of the Big Hole River is a tributary of the Big Hole River. The Big Hole River is a tributary of the Jefferson River, which is approximately 142 mi (229 km) long, in southwestern Montana. The Big Hole River rises in the Beaverhead National Forest in the Beaverhead Mountains of the Bitterroot Range at the continental divide along the Montana-Idaho border in western Beaverhead County. The Big Hole River flows northwest and north, past Wisdom and between the Anaconda Range to the northwest and the Pioneer Mountains to the east. The Big Hole River flows around the north end of the Pioneer Mountains, then southeast, past Wise River, where the Big Hole River is joined by the Wise River, and along the east side of the Pioneer Mountains. Near Glen, and turns northeast, joining the Jefferson just north of Twin Bridges. The Big Hole River is a popular destination for fly fishing, especially for trout and is considered one of the last habits in the contiguous United States for the arctic grayling.⁴

USGS Station Number 06024450 on the Big Hole River, near Wisdom is operated seasonally for the Fish and Wildlife Service, (April – October).and is located approximately 11 miles downstream from the northeast park boundary of BIHO. No long-term discharge record exists for the Big Hole River.

CHANNEL AND CONTROL

The streambed is composed of gravels and cobbles interstitially filled with sands and silts. Banks are stable and vegetated with grasses and willows. The channel is straight for about 150' downstream from the vertical staff. Low-flow control is a low-gradient riffle 40' downstream from the vertical staff and at high flows the control is the channel. Bank-full flow occurs at a gage datum around 3.35'. Gage datum is an elevation on the staff plate that all other reference mark elevations are referenced too. (Cross-sectional survey at the station completed October 22, 2002, BIHO Water Year Folder 2002). Graphs of cross section 1 (vertical staff pool) and cross section 2 (discharge measurement site) at the station are found in Section 3, BIHO Water Year Folder 1999.

GAGE

The vertical staff plate measures from 0.00' to 3.33' and is mounted on a wood board that is bolted to channel iron. The channel iron is secured by bolts onto two steel round eight foot posts and can slide up or down on the posts (Section 1, BIHO History Folder). No data recorder was installed. High-water measurements are made from a bridge 1/4 mi. upstream.

Figure 3: Vertical staff after installation in pool, August 1999. Picture by Henrique Barreto, (NPS-WRB).



Vertical staff in Pool

² **Geach, R. D.** 1972 Mines and Mineral Deposits (Except Fuels) Beaverhead County, Montana, Montana Bureau of Mines and Geology Bulletin 85. Montana College of Mineral Science and Technology, Butte.

³ **Wikipedia.** A Web-based, free-content encyclopedia that is written collaboratively by volunteers

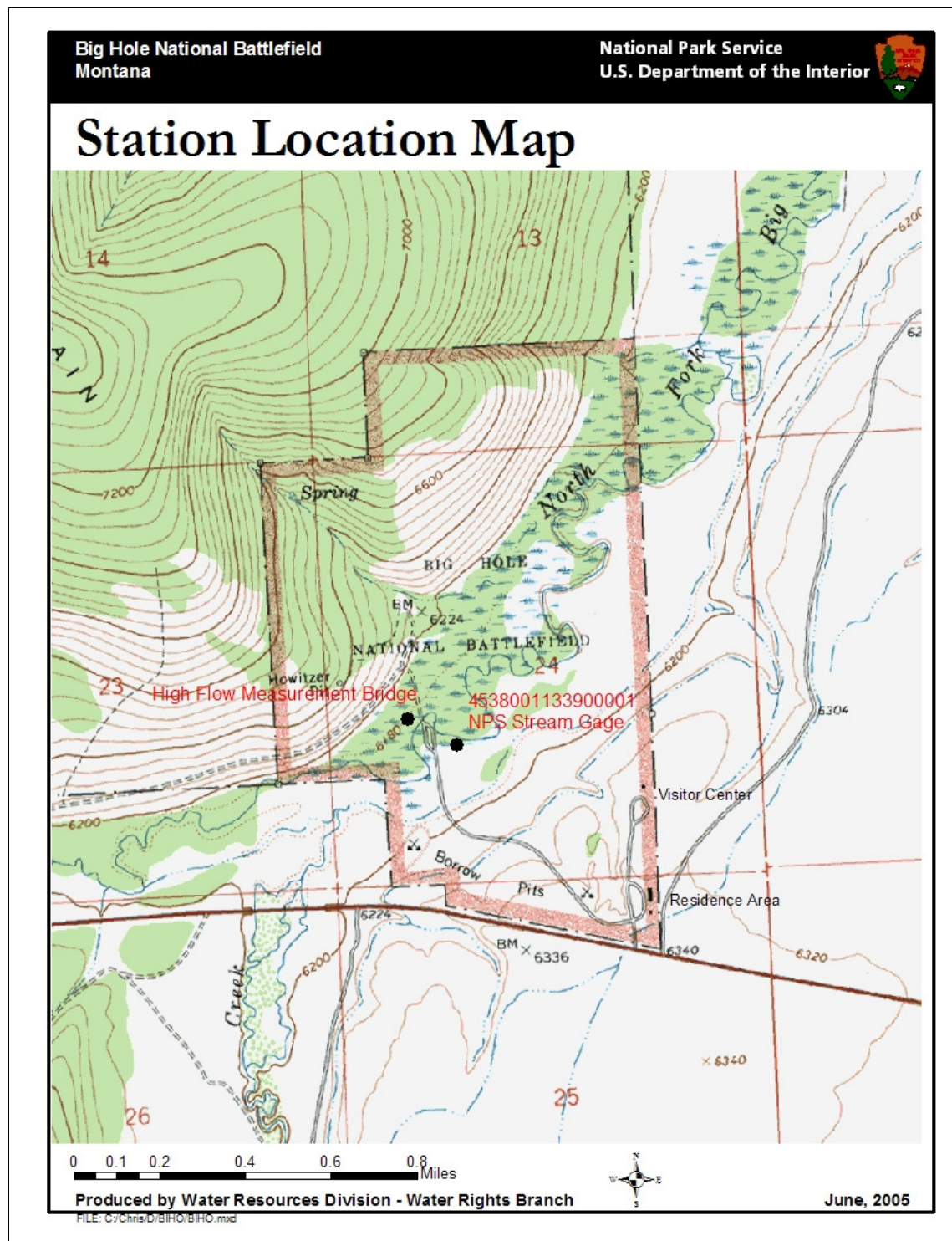


Figure 3: Station Location Map⁵.

⁵ USGS Bighole National Battlefield 7.5' Topographic Map, 1966.

HISTORY

The station has remained at its original location since establishment in 1999. Remnants of a beaver dam occur approximately 200' upstream of the vertical staff. Beaver activity impacts water surface elevations and flow at the station.



Figure 4: Upstream beaver dam, August 1999. Picture by Henrique Barreto, (NPS-WRB).

WY1999 - Station established on August 17th.

WY2000 - No data was collected due to staffing limitations of the NPS - WRB.

WY2001 – NPS - WRB contracted the USGS to collect 4 or 5 discharge measurements throughout the water year. The staff plate was leaning and straightened on 09/25/2001 and reset for a Point of Zero Flow (PZF) of ~0.68'.

WY2002 - NPS - WRB contracted the USGS to collect 4 or 5 discharge measurements throughout the water year.

WY2003 - NPS - WRB contracted the USGS to collect 4 or 5 discharge measurements throughout the water year. Due to increased beaver activity the station was discontinued by the NPS – WRB at the end of the water year.

REFERENCE AND BENCHMARKS

Reference marks are described in field notes and shown in (Figure 5). Pictures are found in Section 1 of the BIHO history folder. Reference marks are permanent markers installed in the ground or on a structure in the vicinity of the station to check for elevation changes throughout the year. NPS - WRB established and used a nail at 2 feet on the vertical staff as the gage datum for this station. Elevations and reference marks are shown in Tables 1 and 2.

Date of Levels	Party	ELEVATIONS IN FEET										*HWM
		RM1	RM2	RM4	RM8	RM9	RM11	3.33' STAFF PLATE	TOP OF WOOD	NAIL @ 2.00'	GAGE HEIGHT	
9/25/2001	C. Gable (NPS)	6.3	4.6	5.8	6.9	6.8	6.1	3.4	3.4	2.0	1.0	NS
4/16/2002	A. Skerda (USGS)	6.3	4.6	*NS	NS	NS	6.1	3.3	NS	NS	3.1	NS
10/22/2002	C. Gable (NPS) A. Skerda (USGS)	6.3	4.6	5.8	6.9	6.8	6.1	3.3	3.4	Nail Missing	1.6	NS
7/8/2003	K.Satler,A.Skerda (USGS)	6.3	4.6	NS	NS	NS	6.1	3.3 8' posts installed 3.4 3.3 Vertical Staff Reset	NS	Nail Missing	1.9 2.0	4.6

Table 1. Elevation of Reference Marks.

*NS – Not Surveyed
HWM – High Water Mark

REFERENCES

RM1 - 3/8" rebar set approximately halfway between the Nez Perce trail and the river. About 70 feet northwest of trail marker #2.
RM2 – 3/8" rebar set near right bank north and upstream of pool where the staff plate is located.
RM4 – 3/8" rebar set to magnetic north of RM1 and east of RM2 and downstream of the staff plate near the riffle on the right bank.
RM8 – ½" rebar set directly across from RM9 set at the drip line of a willow bush.
RM9 – ½" rebar due south from RM8 and set at the drip line of a willow bush. Thirty-one paces southwest of RM4.
RM11 – ½" rebar eight paces west of RM1 and set at the drip line of a willow bush.
3.33' - Top of the staff plate.
Nail set at 2.00' – Nail set at 2 feet in the 2" x 4" wood board where the staff plate is mounted.
Top of wood –Top of 2" x 4" wood board where the staff plate is mounted.

Table 2. Descriptions of Reference Marks.

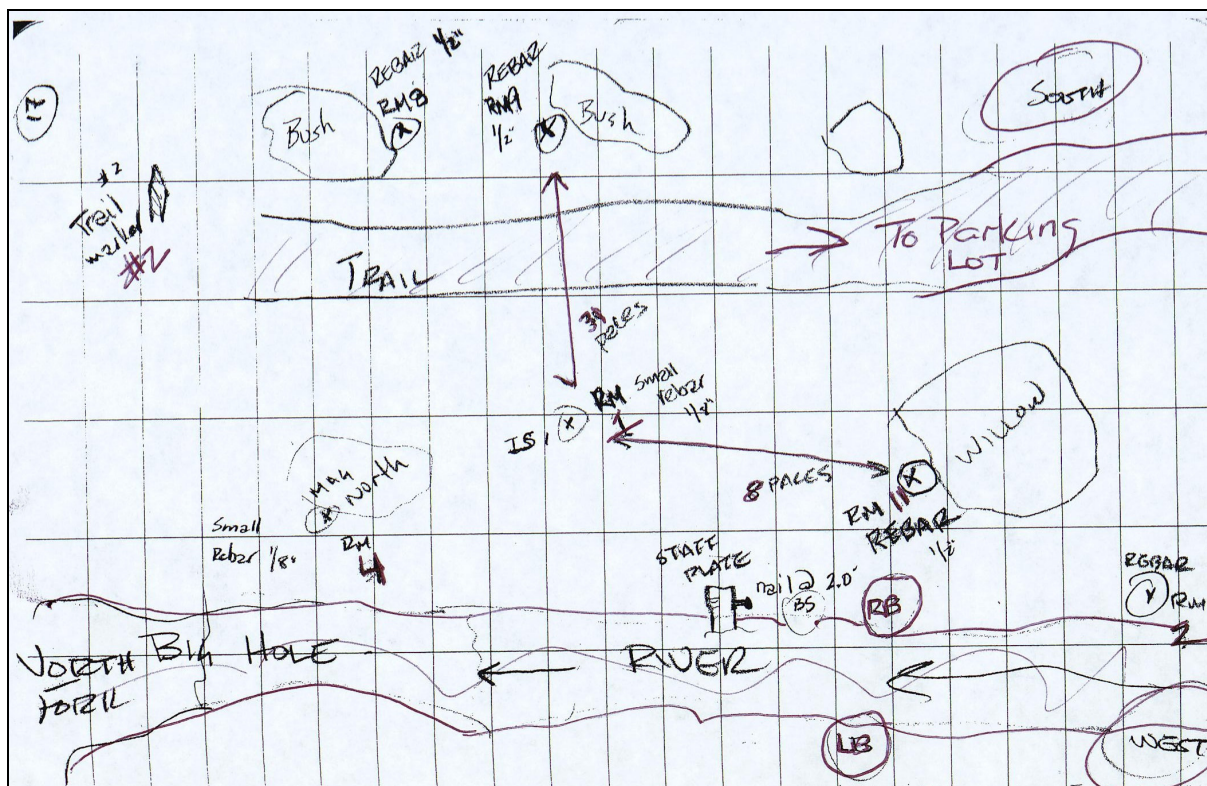


Figure 5. Field sketch by Christine Gable (NPS-WRB) of Reference Marks and Survey Points for BIHO. September 25, 2001.

DISCHARGE MEASUREMENTS

Flows for low and medium stages (200 cfs or less) are considered good. Discharge measurements can be made 40 feet downstream of stream gage. Higher flows are made from the downstream side of the bridge located in the parking lot and upstream of the gage (Figure 2). The bridge measurements are considered fair. A stage – discharge rating was developed to help in administering the United States' Federal Reserve water right for instream flows of the North Fork of the Big Hole River (Section 2, BIHO History Folder).

FLOODS

No floods occurred during the period of record (1999 – 2003). A discharge of 1020 cubic feet per second was measured on May 28, 2005 by the USGS.

POINT OF ZERO FLOW

The point of zero flow is the thalweg or deepest part of the channel at the control and located downstream of the gage pool. A PZF of 0.85' was surveyed on September 25, 2001.

WINTER FLOW

Anchor ice forms along the banks of the channel and ice on the control constricts the stream (Figures 6 and 7). Discharge measurements collected during winter months (December – April) are considered poor due to the poor site conditions.



Figure 6. Station winter conditions, February 06, 2002. Picture by Timothy Fisher, BIHO.



Figure 7. Winter Ice Conditions upstream of station, March 13, 2002. Picture by Timothy Fisher, BIHO.

REGULATION AND DIVERSION

No diversions are known.

ACCURACY

No continuous discharge record. The discharge – rating curve is good from 10 cfs to 1,000 cfs, but more discharge measurements are needed to better define the curve.

COOPERATION

The station is maintained by the NPS -WRB and BIHO staff. Discharge measurements are collected by NPS - WRB, park staff and USGS. The USGS is under contract through NPS - WRB to collect 5 – 6 discharge measurements in a water year. Discharge equipment and funding are provided to BIHO by NPS - WRB.

LOCAL PARK PARTNER

PARK SUPERINTENDENT:

Jon James

PARK RANGER:

Tim Fisher (Primary Contact)

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Fax Phone: 406-689-3151

ADDRESS:

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